IMMEDIATE EFFECTS OF MUSCULAR FATIGUE ON POSTURAL STABILITY AND MOTONEURON POOL EXCITABILITY IN HEALTHY ADULTS

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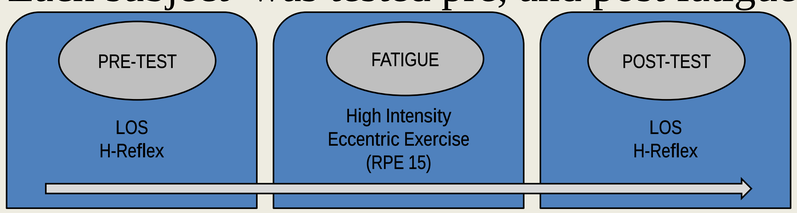
Purpose or hypothesis of the study

Lower extremity muscle fatigue has been implicated in reductions in postural stability. While previous studies have employed high intensity muscular work as a means of fatigue, none have exploited the supra-isometric levels of muscular work provided by eccentric contractions. In addition, few studies have examined the exact mechanisms of fatigue related effects on stability. To gain insight into the influence of eccentric-induced muscle fatigue on postural performance and motor function, we investigated the impact of muscular fatigue on postural stability and motoneuron pool excitability in healthy adults.

Number and kind of subjects

Twenty-one volunteers (25.3 ± 4.5 yrs; female n=9; male n=12) participated in the study. Subjects had no history of surgery/injury to lower extremity within previous 12 months. Each subject was tested pre, and post fatigue.



Materials and methods

Lower extremity fatigue was induced via a single 10-minute bout of high intensity eccentric exercise (RPE 15).

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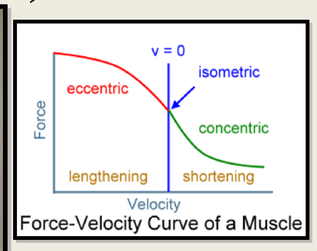
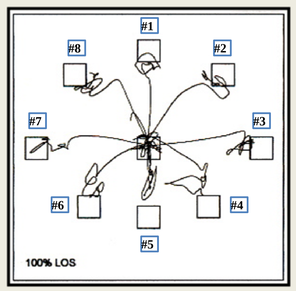
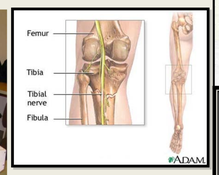
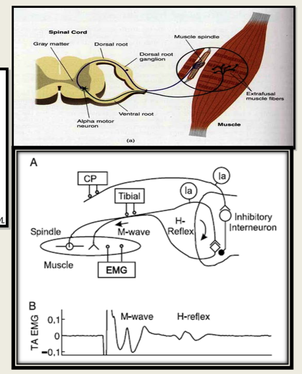


Limits of stability (LOS) testing was used to quantify postural stability. Subjects performed one cycle of LOS testing for familiarization.



H-reflex measurements viewed via electromyography (EMG) were used to measure motoneuronpool excitability. EMG of the soleus muscle and electrical stimulation of tibial nerve provided objective data towards isolating muscle fatigue.

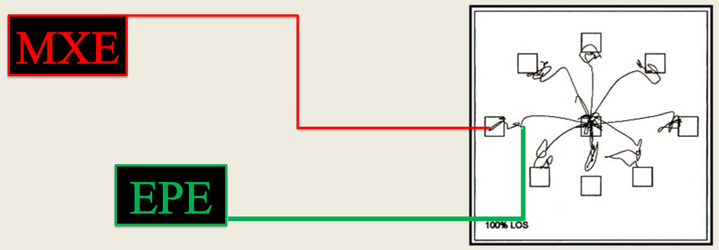




Both measurements (LOS & EMG) were administered prior to and immediately following exercise participation.

Data reduction and data analysis

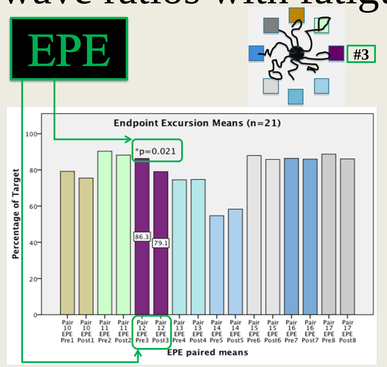
Movement velocity, end-point excursion (EPE), and maximal end-point excursion (MXE) were extracted from the LOS testing.

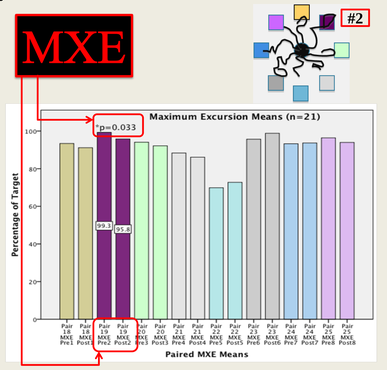


H to M-wave ratios were extracted from the H-reflex testing. Paired T-tests were used with a level of significance set to $\alpha < 0.05$.

Summary and statistical results

EPE #3 (t_{20}=2.505, p=0.021) and MXE #2 (t_{20}=2.284, p=0.033) measures in one direction, were significantly different from pre to post fatigue. There were no differences (p=0.880) in H to M wave ratios with fatigue.





Conclusion and clinical relevance

Stability limits may be compromised following an acute bout of fatiguing eccentric exercise. The lack of consistent changes in postural stability suggests that fatigue may have a greater affect on dynamic tasks compared to static tasks such as standing.[7] In addition, any alterations in stability are likely the result of another mechanism other than compromises in motoneuron excitability.

References

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